BELLCOMM, INC.
955 L'ENFANT PLAZA NORTH, S.W. WASHINGTON, D. C. 20024

B68 11065

SUBJECT: Operational Intercommunication System Monitoring at KSC During Apollo 7 Launch
Case 900

DATE: November 21, 1968

FROM: B. F. O'Brien

ABSTRACT

The performance of the Operational Intercommunication System (OIS-A) was monitored at KSC and MCC during the Apollo 7 countdown. This memorandum summarizes the observations made at KSC.

Measurements of talker levels, noise and crosstalk were made with a VU meter. The amount of background noise on all channels was less than that observed during the CDDT and FRT. The system is still characterized by low-level crosstalk which occasionally is annoying. Talker levels are good and there was much less variation of levels between on site and off site locations than there was during the CDDT and FRT.

(NASA-CR-100239) OPERATIONAL INTERCOMMUNICATION SYSTEM MONITORING AT KSC DURING APOLLO 7 LAUNCH (Bellcomm, Inc.) 11 p

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MEMORANDUM FOR FILE

1.0 Introduction

The Operational Intercommunication System - Audio (OIS-A) was monitored at KSC and MCC during the Apollo 7 launch count by representatives of MOS/Bellcomm. At KSC, the monitoring was done at the Blockhouse, Room 107, on Launch Complex 37, where many of the four-wire OIS circuits from Launch Complex 34 appear. The system was observed from 0015 Z to 0130 Z on October 8, 1968, and from 1800 Z on October 9, 1968 to 1530 Z on October 11, 1968. Table I itemizes the hours of coverage and the monitor personnel.

Periodic measurements were made of talker levels, background noise and crosstalk. Figure 1 is a diagram of the measuring configuration. The OIS volume control at the monitor position was set at the same position for all measurements. This setting corresponded to a comfortable listening level. The OIS channels available were Black 1, 2, 3, 4, 5, and 6; Red 3, 4, 5 and 6; Blue 1, 2, 3, and 4; Green 1, 3 and 5, and Brown 1.

2.0 General Observations

2.1 Summary

Although there were several instances of interference from crosstalk and noise, the OIS system performed well and was operationally usable. The background noise levels on all channels were consistently lower than those observed during the Flight Readiness Test (FRT)[1] and Countdown Demonstration Test (CDDT).[2]

2.2 Talker Levels

The talker levels were about the same as those during the CDDT and FRT. The range of levels was approximately from -15 VU to -30 VU. Variations in the use of microphones and variations between talkers is most likely the major cause of these differences. The off-KSC users (GMIL, SRO and HFLT), who were consistently heard at a higher level than all other

users during CDDT and FRT, were heard at approximately the same level as the average user during the launch count.

2.3 Background Noise

The amount of background noise heard on all channels was lower than that heard during CDDT and FRT. Channels Black 1 and Black 3 were considered the noisest, while Black 2 became noisy on a few occasions. Although the noise was annoying at times, it was not considered a major problem. A chirping noise was reported on Green 8 several times throughout the countdown. Table 2 contains the recorded levels of background noise, as measured at the OIS station in LC 37.

2.4 Crosstalk

Crosstalk was heard on most channels at a low level, and there were several instances of loud intelligible crosstalk. The crosstalk was usually 25 to 35 db below talker level. This range of levels arises primarily from the measurements techniques in which background noise is measured with crosstalk. The noisier channels will therefore indicate a higher level of crosstalk. On a few occasions, the source of the crosstalk was identified, and some of the louder cases are listed in paragraph 3.0. Table 3 lists the recorded levels of background noise plus crosstalk, as measured at the OIS station in LC 37.

2.5 Post-Mission Analysis

At approximately T-3 hours 40 min. (1120 z) trouble was reported on the circuit between the ASTRO-COMM panel in LC 34, and the USB equipment in MILA. It appeared that the noise operated keying circuit was being activated by noise. A tape recording of this circuit (S-Band uplink) during the period 1100 z to 1530 z was reviewed to identify any noisy conditions. No excessive noise was heard until approximately T-1 hour, at which time several static-like noise pulses were noted having amplitudes near the average speech length, as measured with a VU meter.

Recordings of Black 2 and 3 were also reviewed for the period, T-1 hour to T+30 min., but no additional information was obtained. On the Black 2 tape, Black 3 talkers were heard clear and approximately 10 db lower than the Black 2 talkers. On the Black 3 tape, Black 2 talkers were heard clear and approximately 15 to 20 db lower than the Black 3 talkers. This condition probably occurred when the original recordings were being copied, since crosstalk at these levels was not observed during the actual countdown.

3.0 Specific Observations

The following are excerpts from the test-log to illustrate the general trend of trouble conditions during the launch count. Time is given in GMT (ZULU) time.

10/8/68

0107 A user reported that he could not get through on Green 4.

0122 Chirping sound reported on Green 8.

10/9/68

1830 Crosstalk noted on most channels

1832 "Hollow" sound reported on Black 2

2000 Chirping sound on Green 8 reported

2332 Crosstalk Black 1 to Black 2

10/10/68

0307 Loud intelligible crosstalk from Black 1 to Black 3 -47 VU compared to -50 VU noise. Users on Black 3 were at -17 VU and -20 VU.

0425 Intelligible crosstalk from Black 1 to Black 2

0510 Loud intelligible crosstalk on Black 1.-40 VU compared to -48 VU noise

0700 Noise on Black 1 -44 VU to -47 VU

0931 Chirping sound on Green 8 reported

1638 Off-site users (GMIL, SRO and HFLT) heard at average levels, -17 VU

2233 Crosstalk from Black 4 heard on Red 3 and 4, Green 5, Red 5, Blue 1 and 2.

10/11/68

0307 Procedure error: LMP was on Duplex A & B instead of Duplex B (Astrocom on Umbilical Black 3). LMP had complained of weak reception. LMP said that static level is the same (carbon arcs were off)

0347 Down-time requested to investigate noise on OIS/VHF link

0540	Comm check on BK 3, STC/STONEY. Both loud and clear. Report that gain at bridge had been increased 8 db.
0815	Black 1 getting noisier, -44 VU
0850	Users complained of noise on Black 2
0930	Loud crosstalk on Black 6 from Black 5
1120	Trouble reported on the circuit between the ASTRO COMM Panel, and the USB radio at MILA. The voice-operated keying circuit is apparently being activated by noise.
1147	Aeromed-private line in trouble
1147	Blue 3 and 5 heard loud and clear on Black 1. Several cases of crosstalk reported
1416	EMI on VHF from "Aircraft 21" heard on VHF by CDR.
1506	S/C could not read MCC on VHF
1525	Crosstalk on Black 6 from Black 5.

B. F. O'Brien

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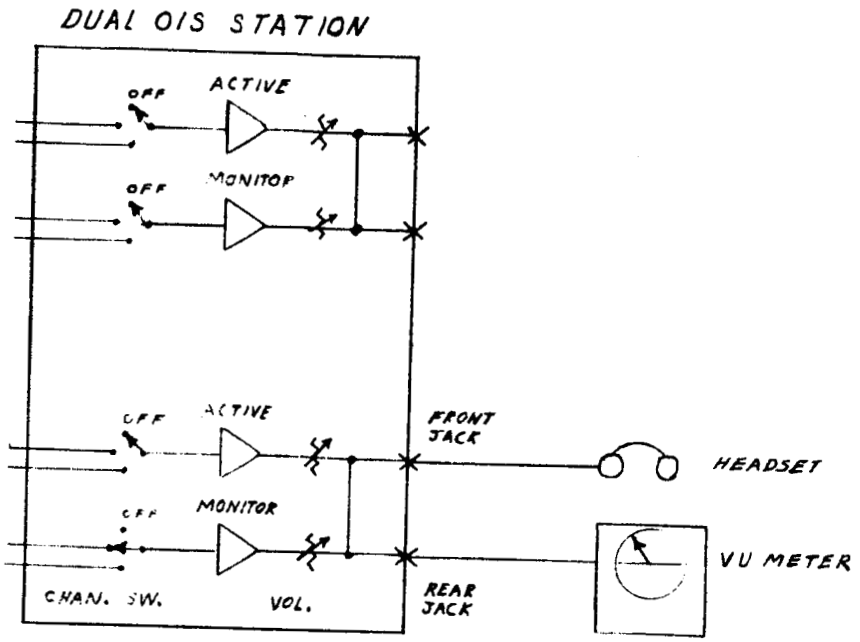

FIG 1
OIS MONITORING
AND MEASURING
CONFIGURATION

TABLE 1

OIS-A MONITORING PERIODS AT LC 37

DATE	TIME	PERSON
10/8/68	0015 to 0130	J. P. Maloy
10/9/68	1800 to 0200	J. P. Maloy
10/10/68	0200 to 1000	B. F. O'Brien
10/10/68	1000 to 1800	L. A. Ferrara
10/10/68	1800 to 0200	J. P. Maloy
10/11/68	0200 to 0900	B. F. O'Brien
10/11/68	0900 to 1530	L. A. Ferrara

TABLE 2

CHANNEL BACKGROUND NOISE IN VU

	10-9-68				10-10-68		TIME (z)										
CHAN.	1930	2130	2230	2322	0100	0215	0330	0430	0530	0730	0930	1030	1130	1230	1330	1430	1530	1630
BK 1	-44	-44	-42	-42		-42	-47	-47	-46	-50	-50	-45	-45	-45	-46	45	-46	-47
BK 2	-50	-50	-48	-48	-52	-52	-56	-58	-58	-58	-58	-52	-52	-52	-52	-52	-52	-50
BK 3		-48	-44	-42	-44	-42	-42	-48	-45	-47	-47	-43	-43	-46	-48	-49	-48	-49
BK 4	-62	-52	-50	-52	-56		-58	-60	-59	-60	-60	-56	-57	-57	-57	-55	-50	-50
BK 5	-60	-60	-60	-62		-60	-60	-60	-60	-60	-60	-62	-60	-58	-53	-61	-55	-61
BK 6		-52	-54	-54	-52	-50	-58	-58	-58	-58	-59	-53	-53	-54	-53	-52	-53	-55
RD 3	-62	-62	-58	-62	-62	-60	-60	-60	-60	-60	-60	-61	-59	-61	-60	-60	-50	-59
RD 4	-62	-62	-62	-62	-62	-62	-62	-62	-62	-60	-60	-62	-62	-62	-62	-62	-62	-62
RD 5	-62	-62	-62	-62			-60	-60	-60	-60	-60	-61	-62	-61	-61	-61	-62	-61
RD 6	-62	-62	-62	-62	-62	-62	-60	-60	-60	-60		-62	-62	-62	-62	-62	-61	-62
BL 1	-62	-62	-62	-62	-62	-62	-60	-60	-60	-60	-60	-61	-62	-62	-62	-62	-62	-62
BL 2		-62	-62	-62	-62	-62	-60	-60	-60	-60	-60	-58	-62	-62	-62	-62	-62	-62
BL 3	-62	-62	-58	-56	-60	-58	-60	-60	-60	-60	-60	-62	-58	-55	-59	-59	-59	-58
BL 4	-62	-62	-62	-62	-62	-62	-60	-60	-60	-60	-60	-61	-62	-62	-62	-62	-62	-62
BL 5		-58	-62	-60	-60	-59		-60	-60	-60	-60	-62	-62	-60	-61	-60	-60	-60
GN 1		-52	-54	-52	-52	-52	-58	-55	-58	-58	-58	-50	-54	-52	-52	-53	-56	-40
GN 3		-48	-52	-52	-52		-60	-60	-60	-60		-55	-55	-55	-54	-53	-53	-53
GN 5	-62	-62	-60	-62	-62	-60	-60	-60	-60	-60	-60	-60	-60	-60	-58	-56	-58	-55
BR 4	-60			-58			-60	-60	-60	-60	-60	-61	-60	-52	-52	-60	-55	-48

TABLE 2

CHANNEL BACKGROUND NOISE IN VU

	TIME (Z)																	
	10-10-68							10-11-68										
CHAN	1730	1800	1930	2030	2200	2300	2400	0100	0230	0330	0430	0530	0800	0930	1030	1130	1230	1430
BK 1	-43	-46		-42	-46	-44	-46	-42	-47	-48	-48	-48	-47	-52	-47	-46	-45	-45
BK 2	-52	-52		-52	-52	-52	-54	-52	-60	-58	-58	-58	-58	-43	-53	-52	-52	-50
BK 3	-47	-44	-46	-42	-50	-44	-42	-42	-44	-53	-53	-53	-49	-47	-45	-42	-42	-43
BK 4	-51	-52	-50	-52			-48	-48		-60	-60	-60	-53	-45	-46	-55	-50	-58
BK 5	-60				-62	-62	-62	-62	-60	-60	-60	-60	-60	-58	-59	-60	-58	-60
BK 6	-53		-52	-54		-50	-50	-54	-58	-58	-58	-58	-54	-53	-55	-52	-50	-53
RD 3	-58	-62	-62	-62		-62	-62		-60	-60	-60	-60	-60	-58	-59	-58	-58	-58
RD 4	-62	-62	-62	-62		-62	-62	-62	-60	-60	-60	-60	-60	-61	-62	-62	-62	-61
RD 5	-62	-62	-62	-62	-62	-62	-62	-62	-60	-60	-60	-60	-60	-62	-62	-62	-62	-62
RD 6	-60	-62	-62	-62	-62	-62	-62	-62	-60	-60	-60	-60	-60	-58	-59	-59	-60	-60
BL 1	-62	-62	-62	-62	-62	-62	-62	-62	-60	-60	-60	-60	-60	-62	-62	-62	-62	-61
BL 2	-62	-62	-62	-62	-62	-60	-62		-60	-60	-60	-60	-60	-62	-62	-62	-61	-62
BL 3	-58		-62	-60	-60	-62			-60	-60	-60	-60	-60	-58	-58	-58	-59	-55
BL 4	-61	-62	-62	-62	-62	-62	-62	-62	-60	-60	-60	-60	-60	-61	-62	-62	-62	-60
BL 5	-60					-54	-60	-58	-60	-60	-60	-60	-60	-61	-62	-62	-58	-59
GN 1	-52	-52	-52	-54	-54	-50	-52	-52	-60	-58		-58	-55	-48	-50	-49	-45	-49
GN 3	-52	-54	-54	-54	-60	-52	-52	-52	-54	-58	-60	-60	-58	-52	-52	-51	-50	-55
GN 5	-58	-56	-62	-62	-62	-58	-60	-60	-60	-60	-60	-60	-60	-57	-58	-58	-57	-58
BR 4	-48	-54		-58		-54	-56	-52	-60	-60	-60	-60	-60	-61	-62	-62	-62	-61

TABLE 3

NOISE + CROSSTALK IN VU

CHAN.	10-9-68 1830	1930	10-10-68 0730	0930	1130	1230	1630	TIME (z) 10-11-68 0330	0530	1030	1130	1230	1430
BK 1						-43	-44	-44	-46	-43	-43	-42	-40
BK 2						-50	-48			-48	-42		-41
BK 3						-45	-46		-45			-40	
BK 4				-59		-49	-45					-47	-50
BK 5	-52									-47		-47	-58
BK 6	-50	-50			-47		-50	-47	-50		-40	-40	
RD 3							-57						
RD 4	-												
RD 5													
RD 6													
BL 1													-60
BL 2		-50											
BL 3						-52					-56	-56	
BL 4													
BL 5						-56	-43					-55	-50
GN 1	-48	-46	-55	-50	-50	-48	-48			-48	-47	-40	-47
GN 3	-46	-46	-58			-50	-50				-49		-48
GN 5					-57								
BR 4													

REFERENCES

1. B. F. O'Brien, Memorandum For File, "Operational Intercommunication System Monitoring at KSC During Apollo 7 FRT," November 8, 1968, Case 900.

2. B. F. O'Brien, Memorandum For File, "Operational Intercommunication System Monitoring at KSC During Apollo 7 CDDT," September 25, 1968, Case 900.

BELLCOMM, INC.

Subject: Operational Intercommuncation System Monitoring at KSC During Apollo 7 Launch

From: B. F. O'Brien

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